Chapter 4. Consumptive Uses and Socioeconomic Considerations

This chapter presents a summary characterization of consumptive uses (i.e., commercial and recreational fishing activities), describes the potential displacement resulting from the establishment of MPAs under the Proposed Project and alternatives, and identifies the likely indirect physical effects on the environment. Discussion of CEQA-related impacts on air quality, biological resources, cultural resources, nonconsumptive recreational uses, population and employment, public services and utilities, vessel traffic, and water quality can be found in Chapters 5 to 7.

4.1. CEQA Application of Socioeconomic Factors

CEQA does not require consideration of direct economic or social factors in its impact analyses regardless of the application of economic theory, the determination of cost-benefit analysis for the Proposed Project and the particularities of the commercial and recreational consumptive fishing industries; State CEQA Guidelines Section 15131 states that "economic or social effects shall not be treated as significant effects on the environment." Unlike the Congressional Budget Office and its financial assessments of federal policy changes, CEQA does not require the determination or presentation of dollar amounts associated with the costs or benefits of a policy change or project implementation. Therefore, no significance criteria for the Proposed Project's socioeconomic impact on commercial and recreational consumptive uses are to be established. CEQA does, however, concern itself with economic or social effects when these impacts cause a physical effect on the environment (Bass et al. 1999). Consequently, this linkage between the potential economic or social changes of commercial and recreational consumptive use and the indirect effect on the physical resources on which those industries depend will be discussed further in this chapter. Detailed analysis of the potential economic effects of the Proposed Project can be found separately in Scholz et al. 2006b and Wilen and Abbott 2006.

4.2. Characterization of Fishing-Related Industries

Commercial fishing (by nets, traps, lines, diving, and other methods) occurs at various locations off the coast of California. There are two main port areas encompassed by the central coast study region: the Monterey Bay port area and Morro Bay port area. The Monterey Bay port area includes the ports of Monterey, Moss Landing, and Santa Cruz. Relatively small landings of commercially fished species, which are included in the Monterey Bay port area statistics, also occur at Mill, Willow, and Big Creeks. The Morro Bay port area includes the ports of Morro Bay and Port San Luis/Avila, and the smaller port of San Simeon. During the 1999–2004 period, on average, the annual landings from all ports within the central coast study region totaled approximately 68 million pounds of fish and invertebrates with an average annual ex-vessel value (price paid to fishermen) exceeding $15 million. A disparity exists in the average price per pound for total landings from the two port areas; this is largely due to the major contribution of the coastal pelagic species (squid, sardine, mackerel, and anchovy) to the Monterey Bay port area landings. These fisheries typically are high-volume with a corresponding relatively low price per pound. Morro Bay generally is not a major port for coastal pelagic species, although in some years squid landings may be significant (CDFG 2005a).

In the Department's Table of California Commercial Landings for 2004,121 categories of fishes and 16 categories of invertebrates were listed with landings in the Monterey Bay or Morro Bay port areas. This does not correspond exactly to the number of species landed because some of the categories are market categories containing multiple species. In addition, the landings totals include some poundage harvested from north or south of the study region's latitudinal boundaries. In summary, however, these statistics attest to the high value and diversity of fishery resources in waters off the Central Coast (CDFG 2005a).

4.2.1. Commercial Fishing

Commercial fisheries that have the greatest potential to be impacted by the implementation of new or expanded MPAs are those that occur primarily or significantly within state waters of the central coast study region and target primarily residential, nonmigratory species, or species such as squid which are highly mobile but which spawn, and which are harvested, in nearshore waters. The nearshore waters along the coast contain giant rocky reefs, kelp beds, and expanses of soft bottom that provide habitats for numerous species. Nearshore species are caught within these locales. These include nearshore and shelf rockfishes, lingcod, cabezon, kelp greenling, California halibut, butterfish, jacksmelt, surfperches, squid, Dungeness crab, and rock crab (CDFG 2005a).

Live fish trapping (e.g., rockfish, cabezon, and other nearshore species) occurs primarily in the shallower waters near the coastline. Hook-and-line fisheries catch a variety of species on hand lines, longlines, rod-and-reel, and trolled gear. The main species caught in hook-and-line fisheries is rockfish. The use of gill nets is not allowed within state waters. Commercial drift gill netting for pelagic sharks and swordfish occurs in the open waters throughout portions of the Pacific Ocean (CDFG 2002).

4.2.1.1. Commercially Harvested Species

Important commercial fisheries include:

- **Finfishes:** Finfishes include king salmon, Pacific sardine, sablefish, albacore and other tuna, thornyheads, northern anchovy, Dover sole, California halibut, nearshore, shelf, and slope rockfishes, sanddabs, other flatfish, cabezon, grenadier, lingcod, sharks, white seabass, mackerel, butterfish, kelp greenling, jacksmelt, and surfperches.

- **Invertebrates:** Invertebrates include squid, spot prawn, Dungeness crab, rock crab, ocean shrimp, and red urchin. However, some of these species are caught primarily outside of the study region and landed at central coast ports.

Brief profiles of the most important commercial fisheries[1] within the central coast study region can be found in Appendix D. Some of the fisheries included in these profiles operate largely or entirely outside state waters; these include the albacore and other tuna, swordfish, shark, and ocean shrimp fisheries. In addition, while red urchins are harvested within state waters, the harvest occurs outside the central coast study region. However, these fisheries are still important to the local economy within the study region (CDFG 2005a).

Spot Prawn

The spot prawn (*Pandalus platyceros*) fishery in the study region is by trap only. The trap fleet operates with boats ranging in size from 20 to 75 feet. Trap designs are limited either to plastic oval-shaped traps or to the more popular rectangular wire traps. Normally, a fisherman will set 25 to 50 traps attached to a single groundline (string) with anchors and buoys at both ends. Traps are set at depths of 450 to 1000 feet along submarine canyons or shelf breaks (CDFG 2002).

Salmon and Trout

Populations of the Central California Coast coho salmon (*Oncorhynchus kisutch*) Distinct Population Segment (DPS) occurring within the central coast study region are listed as threatened under the federal Endangered Species Act. In the study region, there are 5 coastal rivers or streams with current coho presence: Gazos Creek, Waddell Creek, San Vicente Creek, San Lorenzo River, and Scott Creek. The Scott Creek population in the Big Basin hydrologic unit is considered a key population to maintain or improve (CDFG 2005a).

There are three steelhead (*Oncorhynchus mykiss*) DPS in the Central Coast study region with federal status under the Endangered Species Act. The Central California Coast steelhead distinct population segment (DPS) range extends from north of San Francisco Bay (Russian River watershed) down to the Santa Cruz area (just below Aptos Creek) and is listed as threatened. The South-Central California Coast steelhead DPS extends from the Pajaro basin north of Monterey down to the Santa Maria River and is listed as threatened. The Southern California steelhead DPS, listed as endangered, extends from the Santa Maria River south beyond the study region boundary. There are at least 47 coastal streams or rivers with current steelhead presence in the study region (CDFG 2005a).

These two species are of a highly migratory nature and are not likely to directly benefit from the establishment of marine MPAs; however, due to their dependence on

[1] *Important commercial fisheries* are those with average annual landings during the 1999–2004 period of at least 10,000 pounds or average annual ex-vessel value of at least $10,000 in one or both port areas. Some of the fisheries contain multiple species due to the nature of the fishing gear and the association of particular species; others target single species and, while other species may be taken incidentally, either their retention is prohibited or they are of little or no economic value.

healthy estuarine environments during juvenile stages, estuarine MPAs where runs persist may benefit these species (CDFG 2005a).

Sablefish

The geographic distribution of sablefish extends from the Asiatic coast of the Bering Sea to northern Baja California. Adult sablefish are found from less than 300 to more than 4,800 feet deep, but peak abundance off California is at about 1,200 to 1,800 feet. Approximately 50 percent of female sablefish reach maturity at 23.6 inches long and 6 years of age off California. Females grow faster than males from age 2 and attain a larger maximum size. Sablefish may attain an age of more than 50 years and reach a size of 47 inches and 126 pounds but are usually less than 30 inches and 25 pounds (CDFG 2002).

Prior to 1935, statewide landings averaged about 500 tons annually. By 1935, annual landings had risen to 1,400 tons at a time when sablefish livers, because of their high vitamin A content, commanded a higher price than the edible parts of the fish. Landings increased to over 3,000 tons in 1945 due to strong wartime market demand, then varied from approximately 770 to 2,200 tons per year until 1972. More intensive targeting of sablefish began in 1972 with the development and widespread use of sablefish traps, which proved highly effective. Foreign fishing fleets from the U.S.S.R, Japan, and the Republic of Korea fished for sablefish off California from 1967 to 1979, catching relatively minor quantities in most years. However, in 1976 the Republic of Korea reported a catch of 9,500 tons off California. The establishment of the U.S. 200-mile fishery conservation zone in 1977 phased out foreign fishing in those waters; consequently Japan, the principal foreign market for sablefish, became increasingly reliant on imports of U.S.-caught sablefish. Japanese demand for sablefish helped drive California landings to a record high of 14,287 tons in 1979, followed by a market collapse the next year to just 5,141 tons (CDFG 2002).

The first commercial sablefish landing limits were imposed coastwide in 1982 by the PFMC. Prior to that time, market demand, not resource availability or quotas, was the dominant force controlling statewide sablefish landings. From 1982 to 1989, regulations constrained statewide sablefish landings to an average of approximately 6,175 tons. Annual coastwide landing quotas remained at 19,183 tons from 1982 to 1984, then gradually declined to 9,800 tons in 1990 as the stock was fished down to the recommended long-term target level. Between 1990 and 2000, the Allowable Biological Catch (ABC) was reduced slightly to 10,661 tons (CDFG 2002).

Sport utilization of sablefish is negligible, with rare instances of large catches when schools of small sablefish concentrate around public piers. The depth distribution of sablefish normally places them beyond most sport fishing activity (CDFG 2002).

Nearshore Finfishes (Including Rockfishes and Cabezon)

The Nearshore Fisheries Management Act, which is part of the MLMA of 1998, defined nearshore finfish species as rockfish (genus *Sebastes)*, California sheephead *(Semicossyphus pulcher*), greenlings (genus *Hexagrammos*), cabezon (*Scorpaenichthys marmoratus*), and other species found primarily in rocky reef or kelp habitat in nearshore waters(CDFG 2002).

The development of the live/premium fishery in the late 1980s resulted in increasing commercial catches of many species of rockfish occupying the nearshore environment in and around kelp beds. The principal goal of this fishery is to deliver fish live to the consumer in as timely a manner as possible. Trucks or vans equipped with aerated tanks are used to transport fish directly to retail buyers. Nearshore fishery effort and catch increased substantially from 1988 to the late 1990s, but is now highly regulated and landings have declined. It continues to supply communities with live and premium-quality dead fishes. The impetus of this fishery is the unprecedented and increasing high price paid for live fish (CDFG 2002).

Coastal Pelagic Species (Anchovy, Sardine, Mackerel, and Squid)

The coastal pelagic species (CPS), or wetfish, category includes fisheries that generally employ purse seiners, and includes market squid (*Loligo opalescens*), Pacific sardine (*Sardinops sagax caeruleus*), northern anchovy (*Engraulis mordax*), and Pacific mackerel (*Scomber japonicus*).

Market Squid

For more than 100 years, market squid *(Loligo opalescen*s) has been harvested off the California coast from Monterey to San Pedro. The squid fishery has evolved into one of the largest fisheries in volume and economic value in California. Expanding global markets, especially in China and the Mediterranean, coupled with a decline in squid product from other parts of the world, has fueled a rapid expansion of the California squid fishery (CDFG 2002).

The market squid ranges from British Columbia to Central Baja California. Squid reproduction involves spawning within the water column, followed by the deposit of eggs upon the seafloor. In central California, the peak of the fishery targets the squid mating and egg-laying behavior and occurs during spring and summer. In general, the harvest involves luring the animals to the surface with high wattage lamps, encircling them with purse seine nets and pumping or using brail nets to remove the squid from the water, finally storing them in a fish hold. On a good net set, tons of squid may be harvested. Squid are minimally processed, frozen, and shipped around the world, predominately to markets in the Mediterranean and China. Annual squid catches can be greatly influenced by El Niño events (CDFG 2002), as well as by local and world market demand.

Squid play a vital role in the California Current ecosystem and serve as a major link in the food chain as both a predator and as prey. For example, squid prey items include planktonic crustacea, mainly euphausiids and copepods, but also fish, cephalopods, gastropods and polychaetes. In turn, several species of marine mammals from Risso's dolphins *(Grampus griseu*s) to California sea lions *(Zalophus californianu*s), a host of fish species, including many economically important species like tuna and halibut, and a suite of seabirds all depend on squid as a key food source (CDFG 2002).

Pacific Sardine

Historically, the northern subpopulation of Pacific sardines made extensive migrations, moving north as far as British Columbia in the summer months and returning south to southern California and northern Baja California in the fall. At present, the population is currently expanding, found primarily off central and southern California and Baja California, but extends as far north as Vancouver, British Columbia. Contraction and expansion of range and spawning area has been associated with changes in sardine population size around the world. Pacific sardines reach about 16 inches and live as long as 13 years but are usually less than 12 inches and 8 years old. Most sardines in the historical and recent commercial catch were 5 years and younger. There is a good deal of regional variation in growth rate, with average size attained at a given age increasing from south to north (CDFG 2002).

A sustained fishery for Pacific sardines (Sardinops sagax) first developed in response to the demand for food during World War I. Demand grew, and fishing effort and landings increased from 1916 to 1936, when the catch peaked at over 700,000 tons. Pacific sardine supported the largest fishery in the Western Hemisphere during the 1930s and 1940s, with landings occurring in British Columbia, Washington, Oregon, and California. The fishery collapsed beginning in the late 1940s and declined, with short-term reversals, to less than 1,000 tons-per-year in the late 1960s. There was a southward shift in the catch as the fishery decreased, with landings ceasing in the northwest in the 1947-1948 season and in San Francisco in 1951-1952. Through the 1945-1946 season, most California landings were at Monterey and San Francisco, but San Pedro accounted for most subsequent landings (CDFG 2002).

Landings of sardines in Mexico began to increase from an annual average of 1,600 tons during the 1980s, to an average of nearly 42,000 tons per year through the 1990s. The total and average annual harvests by Mexico exceeded those for California over the period 1980 through 1999. Though not targeted by the recreational fishery, Pacific Sardines are used for bait when available (CDFG 2002).

Spawning biomass of the Pacific sardine averaged 3,881,000 tons from 1932 to 1934, and fluctuated from 3,136,000 to 1,324,000 tons from 1935 to 1944. The population then declined steeply over the next two decades, with some short reversals following periods of particularly successful recruitment, to less than 100,000 tons in the early 1960s. During the 1970s, spawning biomass levels were thought to be as low as 5,000 tons. Since the early 1980s, the sardine population has increased, and the total age 1-plus biomass was estimated to be greater than 1.7 million tons in 1998 and 1999 (CDFG 2002).

Northern Anchovy

Northern anchovy are distributed from the Queen Charlotte Islands, British Columbia to Magdalena Bay, Baja California. The population is divided into northern, central, and southern subpopulations or stocks. The central subpopulation ranges from approximately San Francisco, California to Punta Baja, Baja California, with the bulk being located in the Southern California Bight. As juveniles in nearshore areas, anchovies are vulnerable to a variety of predators, including birds and some recreationally and commercially important species of fish. As adults offshore, anchovies are fed upon by numerous marine fishes (some of which have recreational and commercial value), mammals, and birds, including the State and federally listed California brown pelican. A link between brown pelican breeding success and anchovy abundance has been documented. Anchovy are all sexually mature at age 2. The fraction of 1-year-olds that is sexually mature in a given year depends on water temperature and has been observed to range from 47 to 100 percent (CDFG 2002).

Reliable records of California commercial landings of northern anchovy date from 1916. Landings were small until the scarcity of Pacific sardines caused processors to begin canning anchovies in quantity during 1947, when landings increased to 9,464 tons in 1947 from 960 tons in 1946. To limit the quantity of anchovies being reduced to fishmeal, the California Fish and Game Commission required each processor to can a large proportion of the harvest (40-60 percent depending on can size). Anchovy landings declined with the temporary resurgence of sardine landings around 1951. Following the collapse of the sardine fishery in 1952, anchovy landings increased to nearly 43,000 tons in 1953, but subsequently declined due to low consumer demand for canned anchovy and increased sardine landings. Landings remained low through 1964 (CDFG 2002).

During the early years (1916 through 1964), anchovy were harvested almost exclusively by California fishermen. Mexico did not begin harvesting anchovy until 1962. Beginning in 1965, the California Fish and Game Commission managed anchovy on the basis of a reduction quota. This quota had been taken by a fleet of approximately 40 small purse seine vessels operating off southern California known collectively as the “wetfish” fleet, which fishes for other species in addition to anchovy. In 1965, only 171 tons of anchovy were landed for reduction, which increased to an average of over 64,000 tons per year between 1965 and 1982. After 1982, reduction landings decreased dramatically to an average of only 923 tons per year from 1983 to 1991, and fell to zero in 1992 through 1994. During the period 1995 to 1999, only 4 tons were reported as reduction landings (CDFG 2002).

Live bait boats fish for a variety of species, but anchovies comprised approximately 85 percent of the catch prior to 1991. Pacific sardines became available to the live bait fishery again in 1992, and the composition of live bait catches shifted from primarily anchovy to primarily sardine. From 1996 through 1999, sardines constituted approximately 72 percent of the live bait catch. Historically, the anchovy live bait catch ranged from 4,000 to 8,000 tons per year and averaged approximately 4,500 tons annually between 1974 and 1991. This average dropped to slightly over 2,500 tons between 1992 and 1994. Non-reduction (other than for live bait) landings averaged slightly over 2,200 tons per year from 1965 to 1994, and increased to an average of about 4,122 tons per year between 1995 and 1999 (CDFG 2002).

Estimates of the biomass of northern anchovy in the central subpopulation averaged 359,000 tons from 1963 through 1972, increased rapidly to over 1.7 million tons in 1974 and then declined to 359,000 tons in 1978. Since 1978, biomass levels have tended to decline slowly, falling to an average of 289,000 tons from 1986 through 1994. Anchovy biomass during 1994 was estimated to be 432,000 tons. The size of the anchovy resource is now being determined mostly by natural influences, such as ocean temperature (CDFG 2002).

Pacific Mackerel

Pacific mackerel occur worldwide in temperate and subtropical coastal waters. In the eastern Pacific, they range from Chile to the Gulf of Alaska, including the Gulf of California. They are common from Monterey Bay, California to Cape San Lucas, Baja California, but are most abundant south of Point Conception, California. Pacific mackerel usually occur within 20 miles of shore, but have been taken as far offshore as 250 miles. Pacific mackerel are typically found near shallow banks, and juveniles are commonly found off sandy beaches, around kelp beds, and in open bays. The largest recorded Pacific mackerel was 24.8 inches and weighed 6.4 pounds, although commercially harvested Pacific mackerel seldom exceed 16 inches and 2 pounds. Growth is believed to be density-dependent, as fish reach much higher weights-at-age when the population size is small (CDFG 2002).

Pacific mackerel supported one of California's major fisheries during the 1930s and 1940s and again in the 1980s. The canning of Pacific mackerel began in the late 1920s and increased as greater processing capacities and more marketable packs were developed. Landings decreased in the early 1930s, due to the economic depression and a decline in demand, and then rose to a peak of 73,214 tons in 1935. During this period, Pacific mackerel was second only to Pacific sardine in annual landings. The mackerel fishery then experienced a long, fluctuating decline. A moratorium was placed on the fishery in 1970 after the stock had collapsed (CDFG 2002).

In 1972, legislation was enacted which imposed a landing quota based on the age 1-plus biomass. A series of successful year classes in the late 1970s initiated a recovery, and the fishery was reopened under a quota system in 1977. During the recovery period from 1977 to 1985, various adjustments were made to quotas for directed take of Pacific mackerel and to incidental catch limits. These measures were intended to lessen the impact of the recovering population on the jack mackerel fishery, and to accommodate the development of the Pacific mackerel fishery as the population increased. From 1990 through 1999, Pacific mackerel accounted for 87 percent of total mackerel landings in California. Pacific mackerel ranked third in volume of California finfish landings throughout the 1990s (CDFG 2002).

Pacific mackerel have ranked among the top 11 most important sportfish caught in southern California waters, primarily because they are abundant rather than desirable. The recreational catch of Pacific mackerel averaged 1,500 tons per year from 1977 through 1991, and 700 tons per year from 1993 through 1999. During the commercial fishing moratorium, the sport fishery became the largest user of Pacific mackerel in California. The recreational catch increased during the late 1970s and early 1980s, with more than 1 million fish per year caught from 1979 through 1981. Recent estimates of annual recreational catches indicate a steady decline since 1981 to about 200 tons of Pacific mackerel in southern California in 1999. The catches from commercial passenger fishing vessels (CPFVs) have declined from a peak in 1980 of over 1.31 million Pacific mackerel, and an average of over 700,000 fish per year during the 1980s, to an average of slightly over 330,000 fish per year through the 1990s. The reported CPFV catch in 1998 totaled only 136,614 fish (CDFG 2002).

Historical estimates of Pacific mackerel biomass along the Pacific Coast indicate a decline in total biomass from 1932 until 1952. After a brief resurgence, the population reached a peak in 1962, then declined to less than 10,000 tons by 1966, and remained low until the late 1970s. A series of successful year classes beginning in 1976 brought about resurgence, and the age 1-plus biomass peaked in 1982, at over 1 million tons. Since then, it has precipitously declined. Recent stock assessments indicate that biomass in the late 1990s was approximately 120,000 tons. Information derived from deposits of Pacific mackerel scales on the sea floor indicates that the prolonged period of high biomass during the late 1970s and 1980s was an unusual event that might be expected to occur about once every 60 years. It is estimated that the maximum long-term yield of Pacific mackerel might be 29,000 to 32,000 tons under management systems similar to that in current use. It is difficult to assess the effects on the catch of recent warm temperatures, possible changes in availability of young fish, and the deteriorating markets. However, it is unlikely that the recent high harvest levels can be sustained (CDFG 2002).

Flatfishes

The flatfish fisheries of interest include California halibut (*Paralichthys californicus*), starry flounder (*Platichthys stellatus*), sanddabs (*Citharichthys spp.*), and other flatfish. California halibut is caught by trawl and hook-and-line, and is an important fishery in the state. Both recreational and commercial anglers prize flatfish, and they are targeted from boats, piers, and the shoreline. Major fluctuations in landings of some species seem to indicate inconsistent recruitment and availability (CDFG 2002).

Dungeness Crab

Dungeness crab, also known as market crab or edible crab, was first taken commercially off San Francisco around 1848. Currently, Dungeness crab is fished from Avila (San Luis Obispo County) to the California-Oregon border, with commercial and recreational seasons beginning in late fall and ending in early summer. Before the 1944-1945 season, the commercial fishery was centered in the San Francisco area, with average annual statewide landings of 2.6 million pounds (lb). As the fishery expanded into the Eureka-Crescent City area near the end of World War II, landings significantly increased. Since 1945, annual statewide landings have averaged about 9.7 million lb, fueled partly by the replacement of hoop nets with crab traps in the early 1940s. Annual ex-vessel value of Dungeness crab landings have ranged from less than $10 million to about $20 million during the last decade. Approximately three-quarters of the catch is sold as whole crab (live, fresh-cooked or frozen), and the remainder is processed to remove the meat and the meat is vacuum packed before being sold (CDFG 2004).

The commercial fishery for Dungeness crab occurs in two main areas: northern California and central California. Central California fishing areas include Avila-Morro Bay, Monterey, and San Francisco-Bodega Bay. The Morro Bay and Monterey fisheries are minor compared to the San Francisco-Bodega Bay fishery. Central California landings were relatively stable from the 1945-1946 season to the 1955-1956 season, peaking at 9.3 million lb during the 1956-1957 season. Thereafter, landings declined by more than 1 million lb per season through the 1961-1962 season, when only 735,000 lb of Dungeness crab were landed. The central California fishery remained depressed from the 1962-1963 season through the 1985-1986 season, with landings averaging less than 1 million lb per season. Since the 1986-1987 season, however, landings have ranged from slightly less than 500,000 lb to more than 3 million lb with an average 1.7 million lb (CDFG 2004).

Commercial traps for Dungeness crab are essentially the same throughout California. The average circular steel crab trap is 3 to 3.5 ft in diameter and weighs 60 to 120 lb. Each trap is required to have two circular openings that measure 4.25 in. in diameter. Sub-legal male and small female crabs escape through these “escape ports”, which reduce the amount of potentially harmful handling that undersized crabs may be exposed to, and increases the likelihood that the crabs captured will be mostly males that meet or exceed the minimum size limit. Traps must also possess a destruction device that will release captured crabs should the trap become lost. The traps are heavily-weighted and rest on the sea floor; each trap is independently marked with a numbered buoy that floats on the surface. Traps are fished overnight or longer, depending on sea conditions. Most traps are fished at depths ranging from 60 to 240 ft, but some traps are fished in shallower or deeper waters (CDFG 2004).

Rock Crab

The rock crab fishery is made up of three species: yellow rock crab (*Cancer anthonyi*), brown rock crab (*C. antennarius*), and red rock crab (*C. productus*). Approximately 95% of the landings in this fishery come from southern California (CDFG 2002), and commercially abundant populations of rock crabs within the study region are generally found only at the northern and southern ends.

The three species are commonly found on sand near rocky reefs and within kelp beds around the holdfasts of kelp plants, where they prey on a variety of invertebrates. Red rock crabs have a wide depth range and commonly occur as bycatch in the central coast spot prawn trap fishery (P Reilly, CDFG, pers. comm.). Rock crabs, along with several species of fish, are considered large predators associated with kelp, but the exact nature of the role that crabs play in kelp forest community dynamics is unknown (CDFG 2002).

Rock crabs are harvested using baited traps. The traps are set and buoyed either singly or as part of a string (two or more traps tied together). Trap designs and materials vary but most employ single chamber, rectangular traps of 2- by 4-inch or 2- by 2-inch wire mesh. Once set, the traps are left in place for 48 to 96 hours before being checked. A single harvester may use 200 or more traps at one time. Fishermen tend to replace their traps in the same location until fishing in that area diminishes. This creates pathways in the kelp canopy because of the passage of the boats along the same course. The kelp that is cut loose will either fall to the bottom to be eaten by sea urchins and other herbivores, drift out to sea, or become part of the beach litter (CDFG 2002).

Tuna

The tuna category includes several highly migratory species, including albacore, bluefin tuna, yellowfin tuna, and bonito. Tuna are caught commercially with hook-and-line gear. Trolling or jig vessels take the majority of albacore, with a small portion using live bait. Additionally, the wetfish fleet may target some tuna species during summer. In some years, they may catch significant amounts of albacore. Historically, commercial effort for albacore has fluctuated over the past 100 years, based primarily on market and oceanic conditions (CDFG 2002).

Aquaculture and Kelp Harvesting

Within the central coast study region, aquaculture and kelp harvesting are intricately linked. There are four marine aquaculture operations: one in Cayucos (San Luis Obispo County), two in Monterey, and one in Davenport (Santa Cruz County), that culture red abalone (*Haliotis rufescens*). The primary source of food for these abalone is giant kelp (*Macrocystis pyrifera*). All of the kelp is sustainably harvested from beds within the study region. In addition, one abalone aquaculturist in Goleta, Santa Barbara

County, and one at Pillar Point harbor, San Mateo County, harvest kelp from beds within the study region. Oysters are cultured in Morro Bay (CDFG 2005a).

Giant Kelp

Giant kelp was first harvested along the California coast during the early 1900s. Many harvesting companies operated from San Diego to Santa Barbara beginning in 1911. Those companies primarily extracted potash and acetone from kelp for use in manufacturing explosives during World War I. In the early 1920s, having lost the war demand, kelp harvesting virtually stopped. In the late 1920s, giant kelp was again harvested off California (CDFG 2002).

Giant kelp is now primarily harvested in California to supply food to several aquaculture companies for rearing abalones. It is also used for the herring-roe-on-kelp fishery in San Francisco Bay. Giant kelp is one of California's most valuable living marine resources, and in the mid-1980s supported an industry valued at more than $40 million a year. The annual harvest has varied from a high of 395,000 tons in 1918 to a low of less than 1,000 tons in the late 1920s. Such fluctuations are primarily due to climate and natural growth cycles, as well as market supply and demand. During the 10-year period 1970 to 1979, the harvest averaged nearly 157,000 tons, while from 1980 to 1989 the average harvest was only 80,400 tons. The harvest was low in the 1980s because the kelp forests were devastated by the 1982–1984 El Niño and accompanying storms, and by the 200-year storm that occurred in January 1988. In most areas, the beds of giant kelp recovered quickly, with the return of cooler, nutrient-rich waters. Harvests in California increased to more than 130,000 tons in 1989 and more than 150,000 tons in 1990 (CDFG 2002).

Administrative kelp bed areas in California waters are numbered from north to south (see 14 CCR 165.5[j][1]) are defined by compass bearings from known landmarks, and applicable commercial regulations pertain to the harvest of giant kelp or bull kelp (*Nereocystis lutkeana*) only. The entire coastline, including southern offshore islands, is numbered, although not all areas contain kelp beds. The administrative kelp beds are classified as closed, leasable, leased (to the state), or open. Closed beds may not be harvested. Leased beds provide the exclusive privilege of harvesting to the lessee. Open beds may be harvested by anyone with a kelp harvesting license (CDFG 2005a).

There are 25 administratively numbered kelp beds within the study region; one of these (Point Sal to Pismo Beach Pier) has no kelp. Three of these beds are closed, six are leasable, six are leased, and 10 are open. Kelp harvesting by aquaculturists presently occurs in three leased beds between Pismo Beach and Cambria and three open beds from Cypress Point, Monterey County, to Point Año Nuevo. Harvesting in beds 204, 207, and 208 is accomplished using a mechanical harvester; harvesting in other beds is done by hand. Approximately 3,600 tons of kelp are harvested annually (CDFG 2005a). In 2005, the primary kelp harvester operating in California, ISP Alginates, ceased its California operations and did not renew its kelp bed leases. The reduction in harvest from this change should be significant in southern California and will reduce harvest in central California in some years.

Giant kelp is also harvested within the central coast for use on the herring eggs-on-kelp fishery in San Francisco Bay. Sections of kelp plants are suspended from lines secured to rafts or under piers; after herring spawn on the kelp fronds, the product is harvested (CDFG 2005a).

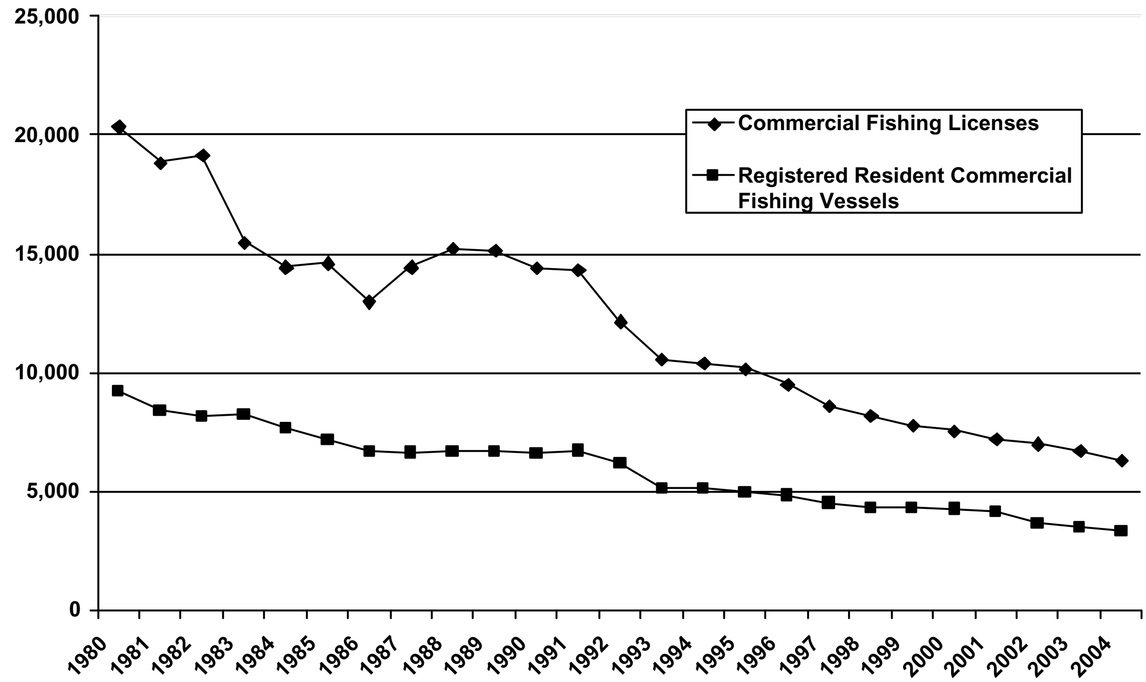
Other Aquaculture

One other aquaculture enterprise exists in the Port San Luis area. Central Coast Salmon Enhancement is a local non-profit entity that raises fingerling salmon in a grow-out holding pen in San Luis Obispo Bay for a few months each year and releases them in fall (CDFG 2005a).

4.2.1.2. Commercial Fishing Industry Trends

During the past 25 years, there has been a trend of a decreasing number of commercial fishermen and commercial fishing vessels participating in California's commercial fisheries. While data are not available specifically for the central coast study region, it is likely that the local trend reflects statewide trends. Since 1980, the number of commercial fishing licenses sold statewide has declined by 69%, from approximately 20,400 to 6,300 in 2004 (Chart 4-1). Since 1988, a decline in licenses sold has occurred every year and has averaged 3.7% per year (CDFG 2005a).

Chart 4-1. Commercial Fishing Licenses and Registered Resident Commercial Fishing Vessels: 1980–2004



Source: CDFG 2005a.

Since 1980, the number of commercial fishing vessels registered statewide has declined by 64%, from approximately 9,200 to 3,300 in 2004. Although a decline in registered vessels has not occurred every year since 1988, the overall decline has averaged 3.2% per year since then (CDFG 2005a).

These trends are due to a combination of many factors, including aging fishery participants; fleet overcapitalization; relatively recent knowledge that the status of many rockfish stocks is poor; recent information that rockfishes are not as productive as once thought; increasingly restrictive fishery management regulations that have attempted to reduce fishing effort (e.g., through the implementation of restricted access fisheries or area-based fishery closures); attempts to reduce, in otherwise healthy fisheries, by catch of species of concern; and intention to reduce potential habitat damage from certain types of fishing gear (e.g., from the use of trawls with large roller gear in complex habitats). In addition, oceanographic conditions during the last two decades of the 20th century have not been conducive to the successful annual recruitment of young rockfishes of many species. However, fishery scientists have seen much stronger recruitment during the several years since 2000, which may indicate a return to more favorable oceanographic conditions for this important group of fishes (CDFG 2005a).

Perhaps the most important aspect of commercial fisheries as related to the MLPA Initiative is the area in which each fishery occurs, more specifically the relative effort occurring in, and the relative value derived from, specific areas. A fisheries survey conducted by Ecotrust (Scholz et al. 2006a) determined the spatial location and extent, as well as a general valuation, of the most important commercial fisheries. The Department has developed spatially explicit data for the squid fishery that occurs within the study region (Figures 4-1a and 4-1b) based on logbooks submitted by fishermen since the early 2000s. The Department also provided spatial information from 1997–98 by Department catch block from logbook data for the spot prawn trawl fishery (Figures 4-1a and 4-1b). Although this fishery operated primarily outside state waters and the use of spot prawn trawl gear is no longer permitted, this data set provides some perspective on the extent of spot prawn habitat adjacent to state waters within the study region (CDFG 2005a).

4.2.2. Recreational Fishing

Recreational fishing is a significant industry and activity along national coastlines, and in California. Nationally, saltwater fishing draws almost 21.3 million recreational anglers, accounting for 10.3% of the American population 16 years or older (Leeworthy 2001). Second only to Florida, the state of California contains more than 2.7 million participants (Pendleton and Rooke 2006). Recreational fishing occurs throughout the central coast study region, although less so in areas along the Big Sur coast due to its remoteness. According to data provided by the Pacific States Marine Fisheries Commission (PSMFC), more than 150 species of finfishes were caught by recreational anglers in 2004 within the study region, although many of these were seen infrequently in sampled catches (CDFG 2005a).

In January 2004, California began an integrated recreational fishery sampling and assessment program called the California Recreational Fisheries Survey (CRFS). The CRFS was implemented through the Recreational Fisheries Information Network program at PSMFC using federal funds from NMFS and state funds from the Department. This program represents an expansion and improvement within California of the previous national sampling program, the Marine Recreational Fisheries Statistics Survey. The CRFS has combined the efforts of the Department's Ocean Salmon Project with other modes of recreational finfish sampling, expanded the number of anglers contacted by samplers, and has provided a more accurate telephone-based survey for estimating private boat angler effort from marinas or from night fishing (not sampled in the field by the CRFS) (CDFG 2005a).

The distribution of recreational fishing effort varies by mode of fishing and availability of access. The CRFS program categorizes recreational fishing effort into four basic modes (CDFG 2005a):

- commercial passenger fishing vessels (CPFVs),

- private and rental skiffs,
- beach and bank, and
- manmade structures.

A discussion of the ranges of recreational fishing vessels can be found in section 7.5 of this document.

Boat-based anglers and divers generally have a target species or species group in mind when they head out to fish, although some anglers or divers fish for whatever is available in their region. Primary target species/species groups in this region are king salmon, nearshore finfishes (rockfishes/lingcod/cabezon/kelp greenling), California halibut, sanddabs, and albacore. A minor amount of effort is directed toward the harvest of Dungeness crab using traps by boats originating from the Santa Cruz harbor (CDFG 2005a).

The beach and bank mode consists of shore-based anglers but also includes divers or anglers entering the water in kayaks, royaks,[2] or on other floatation devices directly from the shore. Shore-based angling comprises the overwhelming majority of fishing effort in this mode. Primary target species/species groups in this region are surfperches, jacksmelt, and several nearshore rockfishes. Kayak fishing generally has a range of 5 miles from any publicly accessible beach or other launch site (CDFG 2005a). Some of the relatively higher-effort shore areas include the Santa Cruz Pier, Monterey Coast Guard breakwater, and beach area south of Guadalupe Nipomo Dunes in San Luis Obispo County (CDFG 2005a).

Manmade structures consist of piers, jetties, and breakwaters. These structures are relatively limited within the central coast study region and with few exceptions are in close proximity to the major port areas. Those exceptions are Capitola Pier in Santa Cruz County, Stillwater Cove in Monterey County, and San Simeon and Cayucos Piers in San Luis Obispo County (CDFG 2005a). Primary target species/species groups in this region for anglers fishing from manmade structures are Pacific sardine, northern anchovy, jacksmelt, surfperches, white croaker, and several nearshore rockfishes (CDFG 2005a). Currently, shore mode fishing represents 70% of all fishing effort, with manmade structures accounting for 61% of all fishing effort (CDFG 2005a).

One form of recreational fishing not sampled by the CRFS program is the charter consumptive dive industry. Within the study region only a few such boats operate; vessel owners are required to submit Department logbooks summarizing their activities (CDFG 2005a). Another subset of recreational fishing, which occurs within the study region but is usually not sampled by the CFRS program, is competitive free-diving meets sponsored by the Central California Council of Divers (CenCal). However, most

[2] *Royaks* are sit-on-top–style kayaks that integrate the features of a surfboard.

dive meets within the central coast are monitored by the Department. Several sites within the study region are used on an approximately annual basis for these meets, and several other sites have been used less frequently (CDFG 2005a).

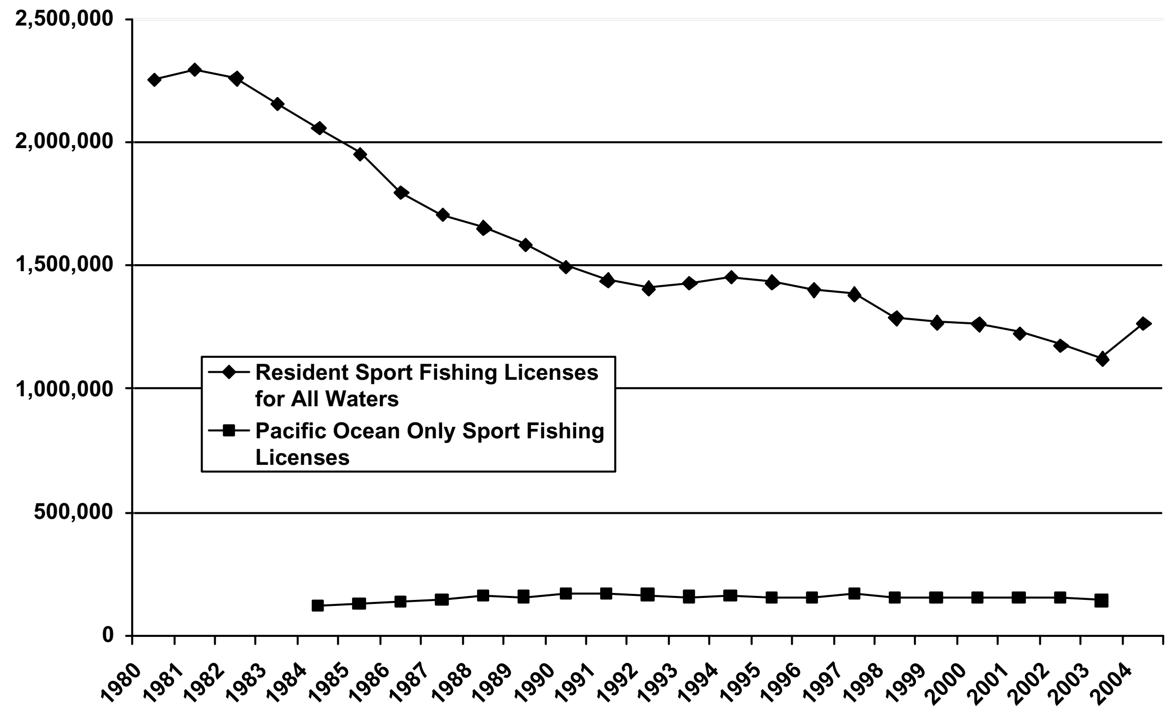
4.2.2.1. Recreational Kelp Harvest

There is a small but unknown amount of kelp harvest occurring within the study region by licensed recreational fishermen. There is no closed season, closed hours, or minimum size limit, and the daily bag limit on all marine aquatic plants is 10 pounds wet weight. No eel grass (*Zostera* sp.), surf grass (*Phyllospadix* sp.), or sea palm (*Postelsia* sp.) may be cut or disturbed (CDFG 2005a).

4.2.2.2. Recreational Fishing Industry Trends

Trends in recreational fishing license sales and boat registrations for CPFVs have not mirrored the trend of an ever-increasing human population in California. Recreational resident fishing license sales for all waters (inland and ocean) declined steadily from approximately 2.25 million in 1980 to approximately 1.27 million 2000 and have since fluctuated with no trend (Chart 4-2). This represents a 44% decrease in a 20-year period (CDFG 2005a).

Chart 4-2. Resident Sport Fishing Licenses for All Waters and Pacific Ocean Only Sport Fishing Licenses: 1980–2004



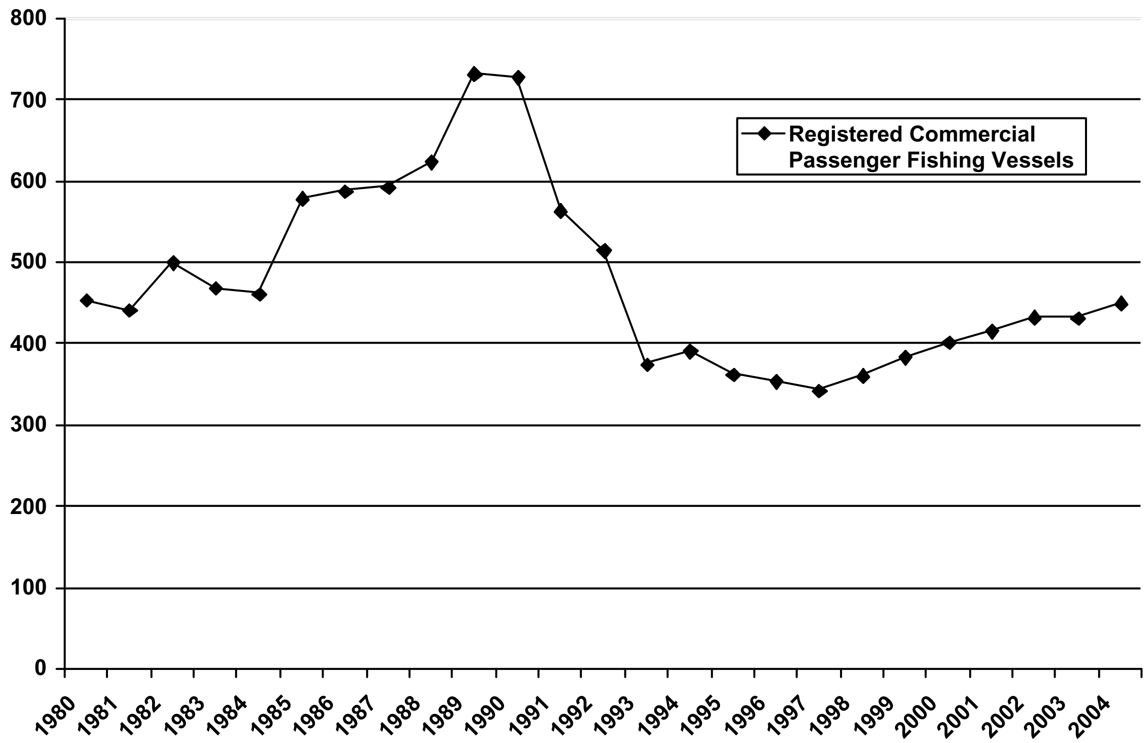
Source: CDFG 2005a.

However, the trend in the sale of Pacific Ocean only sport fishing license is quite different (Chart 4-2). The Department issued this type of license from 1984 to 2003. From 1984 to 1991, license sales increased by 37%, then gradually declined by 16% during the next 12 years to a level higher than that in 1984 (CDFG 2005a).

Statewide registration of CPFVs demonstrates a trend different from both commercial boat registrations and recreational license sales (Chart 4-3). The number of registered CPFVs increased by more than 60% from 1980 to 1989, declined by almost 50% during the next 4 years, and has shown a steady and modest increase during the past decade. Some CPFVs have converted from recreational fishing to whale-watching trips (CDFG 2005a).

Data are not available for the number of CPFV registrations in the central coast study region. However, as a proxy, data are available which show the number of registered CPFVs in the central coast study region that have submitted logbooks each year from 1980 to 2004; this is representative of the active CPFVs in the region, which represent less than 10% of all CPFVs registered in the state (CDFG 2005a).

Chart 4-3. Registered Commercial Passenger Fishing Vessel Licenses: 1980–2004



Source: CDFG 2005a.

Recreational fisheries within the central coast study region that have the greatest potential to be impacted by the implementation of new or expanded MPAs are those that target primarily residential, nonmigratory species. These include nearshore and shelf rockfishes, lingcod, cabezon, kelp greenling, California halibut, jacksmelt, surfperches, and Dungeness crab (CDFG 2005a).

4.2.3. Species Harvested Jointly by Commercial and Recreational Fisheries

The following species/species groups occurring within the central coast study region experienced measurable harvest by both the commercial and recreational fishing sectors in 2004: salmon, nearshore rockfishes, lingcod, cabezon, kelp greenling, California halibut, sanddabs, surfperches, albacore, jacksmelt, northern anchovy, and Pacific sardine. For some species, such as northern anchovy and Pacific sardine, more than 99% of the combined harvest in 2004 was from the commercial sector. For the other species and species groups, the percent of harvest from each sector was highly variable (Table 4-1). Other species, such as shelf rockfishes and white seabass, are also harvested by both sectors, but in 2004 fishery regulations significantly curtailed the harvest of the former, while the latter was generally not available locally to recreational anglers (CDFG 2005a).

While it is true that commercial fishing takes the majority of fish (by number and weight) of all species combined, recreational anglers also harvest substantial numbers of fish. In fact, the majority of the fish taken by commercial fisheries are not species targeted by recreational anglers, especially wetfish species like sardines, anchovies, and squid. The breakdown of catch is, in fact, much more even when looking at certain species, especially in the nearshore environment. For instance, recreational anglers take approximately 60% of all nearshore finfish (based on average landings, 1994–1998).

Table 4-1. Estimated 2004 Total Harvest of Selected Species in the Commercial and Recreational Fishing Sectors within the Central Coast Study Region

Species or Group	Estimated Recreational Harvest (Pounds)	Percent of Total	Estimated Commercial Harvest (Pounds)	Percent of Total	Estimated Total Harvest (Pounds)
King salmon*	44,700*	41.2	63,800*	58.8	**108,500***
Nearshore rockfish	395,400	76.3	123,100	23.7	**518,500**
Lingcod	42,500	45.4	51,200	54.6	**93,700**
Cabezon	4,500	6.4	66,100	93.6	**70,600**
Kelp greenling	3,700	57.8	2,700	42.2	**6,400**
California halibut	35,900	25.4	105,700	74.6	**141,600**
Sanddabs	48,800	23.5	159,300	76.5	**208,100**
Surfperches	83,700	76.6	25,600	23.4	**109,300**
Albacore	24,600	5.4	431,700	94.6	**456,300**
Jacksmelt	44,800	95.3	2,200	4.7	**47,000**
Northern anchovy	2,200	0.1	8,577,600	99.9	**8,579,800**
Pacific sardine	2,200	0.1	34,047,000	99.9	**34,049,200**

*For king salmon only, figures listed are for number of fish, not pounds.

Source: CDFG 2005a

4.2.4. Existing Fishing Closure Zones

Within the central coast study region, the only areas in which all fishing by all gear types is prohibited year-round are the national security area closure off Diablo Canyon nuclear power plant and the five SMRs: Elkhorn Slough, Hopkins, Point Lobos, Big Creek, and Vandenberg. There are other areas closed to some types of fishing year-round, but other types of fishing are permitted. These are summarized below (CDFG 2005a).

Year-round closures to specified commercial gear types include (CDFG 2005a):

- All waters within 3 miles of shore closed to use of trawl gear.
- Within the Rockfish Conservation Area (RCA),[3] take and possession of rockfish, lingcod, California scorpionfish (not found within central coast study region), and ocean whitefish is prohibited with the following gear types: trawl nets, traps, hook-and-line gear with more than one hook and six ounces of weight attached, and set gill and trammel nets with mesh size less than 6 inches. The RCA is defined by depth zones, is different for trawl and nontrawl fisheries, and may change within a year. For trawl fisheries, the RCA is 100 to 150 fathoms[4] within the central coast study region, which is approximately 4% of the study region. For nontrawl fisheries, the portion of the RCA that is closed year-round is from 30 to 150 fm within the central coast study region, which is approximately 37.8% of the study region. The area from 20 to 30 fathoms is open to fishing during certain months in 2005.
- Within state waters, the use of gill nets and trammel nets to take rockfish is prohibited.
- Gill nets and trammel nets may not be used within 3 miles of the mainland shore.
- Within Military Danger Zone 4 off Vandenberg Air Force Base, per 33 CFR 334.1130, the stopping and loitering of any person or vessel is expressly prohibited between the mouth of the Santa Ynez River and Point Arguello unless prior permission is obtained.

Year-round closures to recreational fishing for groundfish species (includes rockfish, lingcod, cabezon, and kelp greenling) at the time of publication of this document include (CDFG 2005a):

- Waters more than 20 fathoms deep north of Lopez Point; this is approximately 37.2% of those waters within the study region north of Lopez Point.
- Waters greater than 40 fathoms deep south of Lopez Point; this is approximately 8.2% of those waters within the study region south of Lopez Point.

[3] The descriptions of the RCA in this document are current as of the publication of the document. The boundaries and depth restrictions in the RCA change between and within years.

[4] A fathom is a nautical measurement equal to 6 feet.

- Within Military Danger Zone 4 off Vandenberg Air Force Base, per Title 33 CFR 334.1130, the stopping and loitering of any person or vessel is expressly prohibited between the mouth of the Santa Ynez River and Point Arguello unless prior permission is obtained.

- The RCA for 2005 is illustrated in Figure 6.1-4.

In addition to the above year-round closures, seasonal closures exist for many commercial and recreational fisheries within the central coast study region. While these seasonal closures provide benefits by helping to sustain those individual fisheries, unlike SMRs, they do not allow individual or multiple populations of fished species in the areas where the seasonal closures occur to achieve the same size and age structure (CDFG 2005a).

4.3. Economic Effects of Proposed MPAs

The implementation of an MPA network component alters the economic and social dynamics of consumptive uses of the fishery resources. In general, fishing reduces species abundance, alters size and age composition of fished populations, alters species diversity, changes biological interactions among species, and sometimes alters habitats. More importantly to CEQA, a new MPA network component changes physical resource of the species, population, community and meta-population dynamics in and around the zones of no or limited take.

4.3.1. Microeconomic Considerations

Commercial uses of the marine system are a major source of revenue for the American economy. In 2000, commercial fisheries alone added approximately $27 billion per year to U.S. gross domestic product (NOAA 2000). Some or all forms of commercial fishing and kelp harvesting would be displaced activities in many of the MPAs in the proposed network component; therefore, these user groups could be expected to suffer losses and increased costs to conducting their business. The displacement effort[5] both across fishing grounds and into other fisheries has been argued as the fundamental driver to determine the type and magnitude of the benefits and costs from the implementation of MPAs (Sanchirico et al. 2002). Sanchirico and Wilen (2001) discuss the ecological/biological and socioeconomic conditions under which commercial fisheries might suffer short- or long-term costs. These include:

- lost harvest revenue and income to fishermen;

- secondary losses in output/sales, income, jobs and tax revenue in local economies;

[5] *Displacement effort* is the additional effort or cost to do business beyond that which would normally occur as a result of some action or change affecting the business.

- no loss in harvest but increased cost of harvesting due to increased travel-related cost, resulting in lost income to fishermen (displacement effort);
- losses in consumer's surplus to consumers of commercial seafood products (if prices rise for fishery products due to reductions in harvests);
- overcrowding, user conflicts, possible overfishing or habitat destruction in remaining open areas due to displacement (this could raise costs or lower harvests);
- loss of fishermen's harvest knowledge (as a result of displacement) that may support sustainable fishing practices; and
- social disruptions from losses in incomes and jobs.

The reality of these costs depends greatly on the offsite impacts, such as habitat degradation and reduction of fishable waters (Sanchirico 2000), fishery management regulations, and the economic conditions and behavioral responses of the fishing industry (CDFG 2002a), as well as behavioral responses of individual fishing operations, associated secondary industries (i.e., processing, distribution), and consumers.

These potential losses could be offset by increased biomass and aggregate harvests within the new fishing locations outside of the MPAs, also known as the spillover effect.[6] Within the estimated timeframes necessary for habitats and fish stocks to improve (i.e., on the order of 5 years or more), expected long-term benefits to commercial fishing could include:

- Long-term increases in harvest revenue and income to fishermen;
- Long-term increases in secondary output/sales, income jobs and tax revenues in local economies;
- Long-term increases in consumer's surplus to consumers of commercial fishing products (if prices to consumers decline with increased harvest); and
- Long-term increases in economic rents[7] (may or may not exist in open access fisheries).

[6] *Spillover effect* is defined as follows: as the number and biomass of individuals increase within reserves, many species will move out of reserves into fishing grounds, enhancing stocks in fished areas through spillover.

[7] *Economic rent* is a return on an investment over and above a normal rate of return on investment.

Some of the literature has shown that it is possible for no short- or long-term losses to occur (Leeworthy and Wiley 2001). Consequently, as the datasets improve and adaptive management provides real world examples and feedback loops (Murray et al. 1999), economic theories need to be applied to this specific case and all of its associated permutations.

4.3.2. Macroeconomic Considerations

Many fishermen, especially commercial fishermen, have expressed concerns about outside and internal forces that they believe are affecting their ability to maintain sustainable fisheries. These influences were identified in the ethnographic data survey conducted for the Channel Islands National Marine Sanctuary (Kronman et al. 2000) and are summarized below:

4.3.2.1. Outside Forces

- Poor Asian economy is affecting the ability to sell fish overseas.
- Elasticity of global and local consumption of fishing commodities and sensitivity of commodity pricing.
- Variable exchange rate for U.S. dollar.
- International competition may eliminate markets if U.S. fishermen cannot supply during closed seasons.
- Increased cost of living in coastal areas creates a need for more income.
- El Niño events create natural fluctuations that decrease catch and income.
- Pollution and habitat destruction from coastal development have as much or greater effect than fishing.
- Conflicts over environmental allocations and ecological interactions (i.e., sea otters, seals and sea lions, birds) need to be addressed.
- Conflicts among user groups should be dealt with prior to creating new regulations.

4.3.2.2. Internal Forces

- Aging workforce will not be replaced if new participants are not allowed into the fisheries.

- Industrial organization (buyers and processors with monopoly power over fishermen) leaves little ability to maintain price structures.

- Open access and overcapitalization and biological or economic overfishing has led to economically unsustainable fisheries.

4.3.3. Fishery Displacement and Congestion

The primary potential impact to fishing vessels is the displacement of fishing activity resulting from the implementation of proposed MPAs, particularly the no-take SMRs and SMCAs that prohibit the take of bottom fishes and invertebrates. Depending on the level of harvest restriction and applicable species, each fishing operator who currently fishes within a proposed MPA will face a varying degree of pressure to move to alternate fishing locations. This could conceivably result in a secondary pressure to fishing operators to increase congestion and competition at particular fishing hotspots or along the immediate boundary of the new MPAs. Primary effects are addressed below. Secondary effects and behavioral responses (e.g., effects relating to ancillary business – fishing supplies, fuel, boat repairs, etc.) are too speculative.

Displacement may impact both commercial and recreational fisheries. Although the fisheries extend beyond the study region of the MPAs, the analysis of aerial extent is limited to the MLPA Initiative's central California coast study region (Figure 1-2). For commercial fisheries, 19 fisheries considered in the analysis were identified as at least partially conducted in state waters, of some economic importance, involve fishing gear that is expected to influence benthic habitat, and are not spatially well-distributed in existing fisheries datasets (Scholz et al. 2006a). Not all commercial fisheries operating within the study region were surveyed.

4.3.3.1. Commercial Fisheries Displacement

Table 4-2 provides an understanding of the size and ranking of valuable commercial fisheries in the study area. Furthermore, it assesses the potential displacement of each resource by tabulating an overlay analysis of the maps provided by 109 fisherman surveyed by Scholz et al. (2006a) with the aerial extent of the proposed project and Alternatives 1 and 2. The reduction in valued harvestable area for each individual fishery is considered in relation to the overall study region of the entire central coast (approximately 860 nm^2).

Table 4-2. Commercial Fishery Catch, Value Ranking and Alternative Effects

Commercial Fishery	Study Region Landings (1999–2004 Avg. Pounds)	Rank by Value of Study Area Landings (1999–2004 Avg. Nominal Ex-Vessel Revenues)	Percent Area of Important Fishing Grounds in the Study Area Potentially Affected		
			Proposed Project	Alternative 1	Alternative 2
Squid	22,615,304	1	5.02	6.17	10.30
Salmon	975,800	2	6.22	3.42	10.30
Spot Prawn	129,237	4	12.82	7.28	15.48
Sardine	26,354,126	5	6.76	5.24	11.09
Sablefish	758,397	6	23.81	6.83	23.30
Rockfish Nearshore	157,573	7	20.86	14.30	25.64
Deep Nearshore Rockfish			21.93	16.49	22.80
Cabezon	91,359	11	22.20	14.64	27.71
Anchovy	9,936,324	12	7.71	5.72	10.89
Halibut	123,495	14	7.80	6.44	10.02
Dungeness crab	103,547	15	12.84	4.50	12.83
Rockfish Slope	438,030	16	21.80	14.33	24.76
Rockfish Shelf	226,369	19	8.27	7.46	12.67
Rock Crab	89,200	20	13.42	11.99	13.30
White seabass	33,608	22	7.53	9.11	8.16
Lingcod	36,997	23	19.82	13.11	25.57
Kelp Greenling	6,731	26	18.92	13.12	23.92
Surfperch	15,413	28	4.78	2.73	5.06
Mackerel	294,720	29	7.75	5.36	10.28

Source: Scholz et al. 2006a

As indicated by the data, anticipated maximum potential displacement of important commercial fisheries for the Proposed Project would vary from 4.78% (for the surfperch fishery) to 23.81% (for the sablefish fishery). Displacement associated with Alternative 1 would vary between 2.73% (for the surfperch fishery) and 16.49% (for the deep nearshore rockfish fishery). Alternative 2 displacement would vary between 5.06% (for the surfperch fishery) and 27.71% (for the cabezon fishery). When comparing median displacement values as averaged across commercial fisheries, the Proposed Project would potentially affect 13.2% of the important fishing grounds in the central coast study region, Alternative 1 8.9%, and Alternative 2 16.0%.

4.3.3.2. Recreational Fisheries Displacement

For recreational fisheries, data to conduct potential displacement analysis is provided by the CRFS (CDFG and PSMFC 2004) (Figures 4-2 and 4-3). Instead of relying on a survey of the expert opinion of a limited number of fishermen and their geographic assessments, the recreational fisheries data depends on the collection of discrete records of recreational private and rental boat fishing effort that includes both the area of fisheries and the number of boat trips associated with those areas for two of the primary recreational fisheries in California: rockfish and salmon (Scholz et al. 2006b). Known recreational fisheries that were not addressed include lingcod, cabezon, kelp greenling (however, these three species are commonly caught on trips targeting rockfish), California halibut, jacksmelt, surfperches, Dungeness crab and sanddabs; however, potential effects to these recreational fisheries can be inferred from survey data on primary recreational fisheries. The survey does not include recreational fishing associated with beach and bank, manmade structures, or diving. In 2004, the total number of sampled boat trips in the central coast region was 1,671 and 2,944, respectively, for rockfish and salmon. The total area for fishing was almost 321 and 400 square miles, respectively. Table 4-3 represents the potential displacement to recreational fisheries on a percentage basis resulting from the various package alternatives. To derive the percentage for maximum number of trips affected, Scholz et al. (2006b) took the total area of proposed MPAs, in which fishing for salmon or rockfish was prohibited, and divided it by the total recreational fishing area for salmon or rockfish, respectively, within the study region, and then allocated this on a proportional basis by the relative amount of sampled fishing effort within each microblock.

Table 4-3. Rockfish and Salmon Recreational Fisheries: Alternative Effects on Area and Boat Trips

	Proposed Project	Alternative 1	Alternative 2
Rockfish Recreational Fishery			
Total Recreational Rockfish Grounds (Sq. mi.)	320.90	320.90	320.90
Area Affected (Sq. mi.)	38.44	17.58	43.42
Percent of Total Area Affected	11.98%	5.48%	13.53%
Percent of Maximum Number of Trips Affected	21.84%	16.10%	28.25%
Salmon Recreational Fishery			
Area Affected (Sq. mi.)	4.51	0.05	9.66
Total Recreational Salmon Grounds (Sq. mi.)	399.97	399.97	399.97
Percent of Total Area Affected	1.13%	0.01%	2.41%
Percent of Maximum Number of Trips Affected	1.90%	0.14%	2.55%

The survey data for salmon and rockfish recreational fisheries shows considerable differences in potential displacement: the mean salmon displacement being 1.13% and mean rockfish displacement being 11.98%. As expected, Alternative

2, which provides the most area of conservation, results in the greatest amount of potential displacement effect to recreational fisheries, and Alternative 1 provides the least potential effect to recreational fisheries.

4.4. CEQA-Related Environmental Effects

Given the above analysis, it is apparent that to varying degrees across all three alternatives that displacement may occur to some level for both commercial and recreational fishing practices. As would be anticipated, Alternative 1 results in the least amount of potential displacement to commercial and recreational fisheries from MPAs, and Alternative 2 would result in the greatest amount of potential displacement.

Displacement can have several consequences as outlined in sections 4.3.1 and 4.3.2. In summary, fishing effort within the central California coast may become refocused on different locations outside of MPAs, including areas along the periphery of MPAs or locations beyond state waters, or refocused on different species than those protected within MPAs. Fishing effort within the central California coast also could become lower as a result of individual fishermen’s decision to fish less often because of the effort involved, to relocate out of the state, or even to leave the fishery because of increased business costs. This could have some detrimental effect on local economies (Wilen 2006; Pendleton and Rooke 2006), although such effects are anticipated to be limited and of short duration as fisheries recover. Networks of MPAs are promising management tools partially because of their ability to benefit exploited populations and fisheries (Murray et al. 1999), as well as provide a perpetual stream of commercially significant fisheries to areas outside of the MPA network. These would benefit both commercial and recreational fishing activities in the long run.

Displacement of fishing effort outside of MPAs could also lead to an increase in nonconsumptive recreational uses (e.g., marine wildlife viewing, scuba diving, kayaking) inside MPAs, as these locations would be less congested and would not result in conflicts with fishing activities. This would benefit local economies as demand for recreation-related businesses increased.

Ultimately, the choices individual fishermen will make following the implementation of an MPA network component along the central California coast cannot be predetermined; however, the range of potential displacement-related indirect effects on the physical environment requiring consideration under CEQA can be estimated. These are identified below.

4.4.1. Air Quality

The potential exists for increased air emissions as a result of increased transit times by displaced fishing vessels traveling to locations outside of designated MPAs. A discussion of the potential displacement-related effects regarding air quality can be found in Chapter 5 of this EIR.

4.4.2. Biological Resources

The possibility exists that establishment of MPAs will displace and concentrate existing fishing effort into other state waters along the central California coast. Alternately, fishing effort may be attracted to the edges of established MPAs to benefit from potential increases in catch or catch per unit effort. It is suggested that either of these types of congestion could lead to marine species population decline and habitat degradation impacts outside MPA boundaries. A discussion of the potential displacement-related effects to biological resources can be found in Chapter 6 of this EIR.

4.4.3. Cultural Resources

The potential for substantial loss of maritime-related historic resources resulting from displacement-related economic losses is discussed in Chapter 7 of this EIR.

4.4.4. Population and Employment

Displacement of fishing effort could cause economic hardship for a number of individual fishermen resulting in economic effects in local communities. A discussion of the potential for economic blight in association with displacement of fishing effort can be found in Chapter 7 of this EIR.

4.4.5. Public Services and Utilities

Illegal poaching within MPAs could result from displacement of fishing effort, necessitating an increase in enforcement services. A discussion of the potential displacement-related effects to public services and utilities can be found in Chapter 7 of this EIR.

4.4.6. Recreational Nonconsumptive Uses

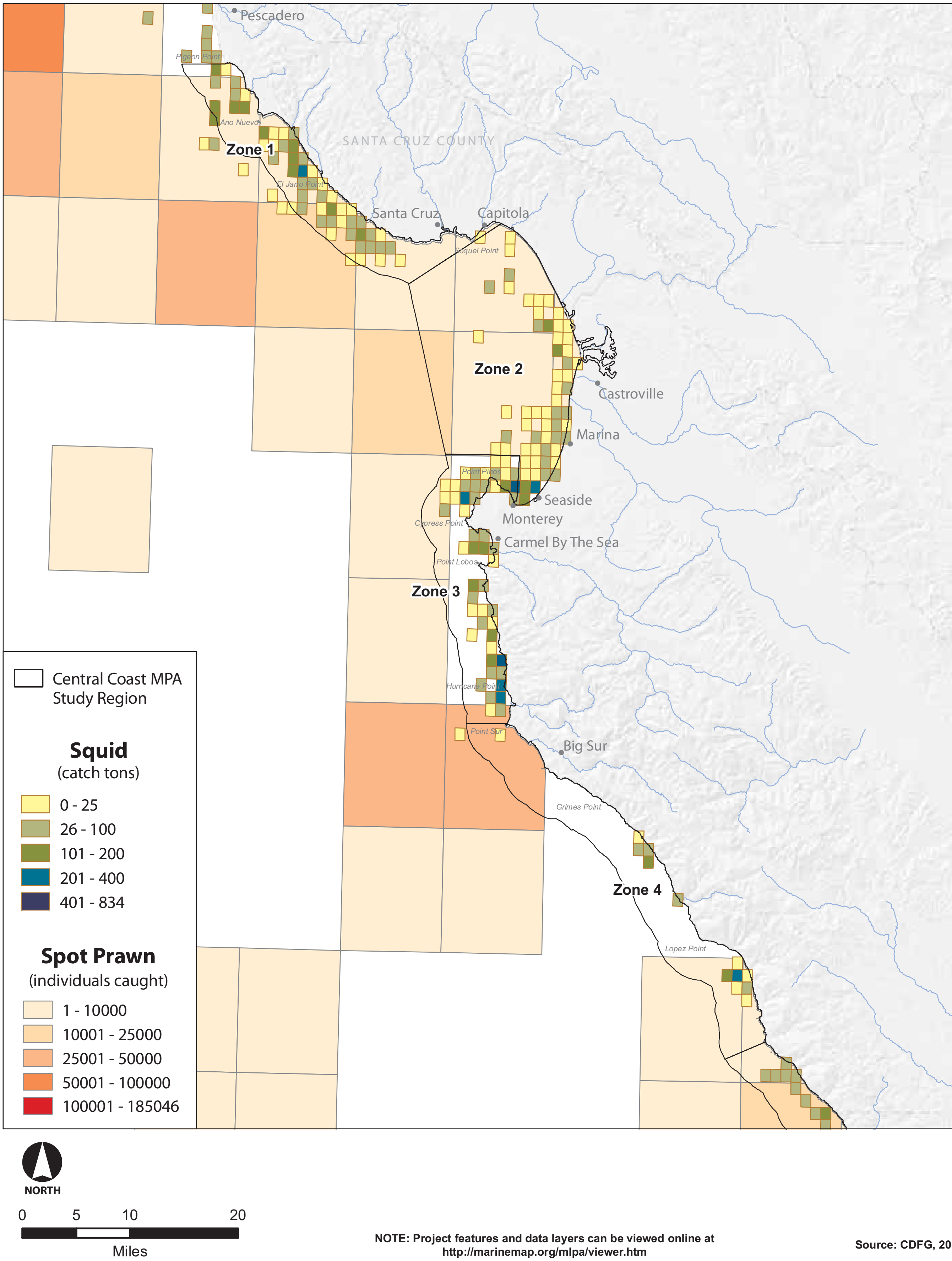
As noted above, displacement of fishing effort to locations outside of MPAs could lead to an increase in recreation use of MPAs themselves. A discussion of the potential displacement-related effects to recreational nonconsumptive uses can be found in Chapter 7 of this EIR.

4.4.7. Vessel Traffic

Displacement of fishing effort to locations outside of MPAs could lead to increased vessel congestion in other areas. A discussion of the potential displacement-related effects to vessel traffic can be found in Chapter 7 of this EIR.

4.4.8. Water Quality

Displacement of fishing effort could cause economic hardship for a number of individual fishermen and result in vessel abandonment. A discussion of the potential displacement-related effects to water quality resulting from vessel abandonment can be found in Chapter 5 of this EIR.



J: \ GIS \ PROJECTS \ CAL_DFG \ 06682_06 \ MAPDOC \ FIG4-1_SPOTPRAWN_SQUID.MXD (PG) 08-31-06

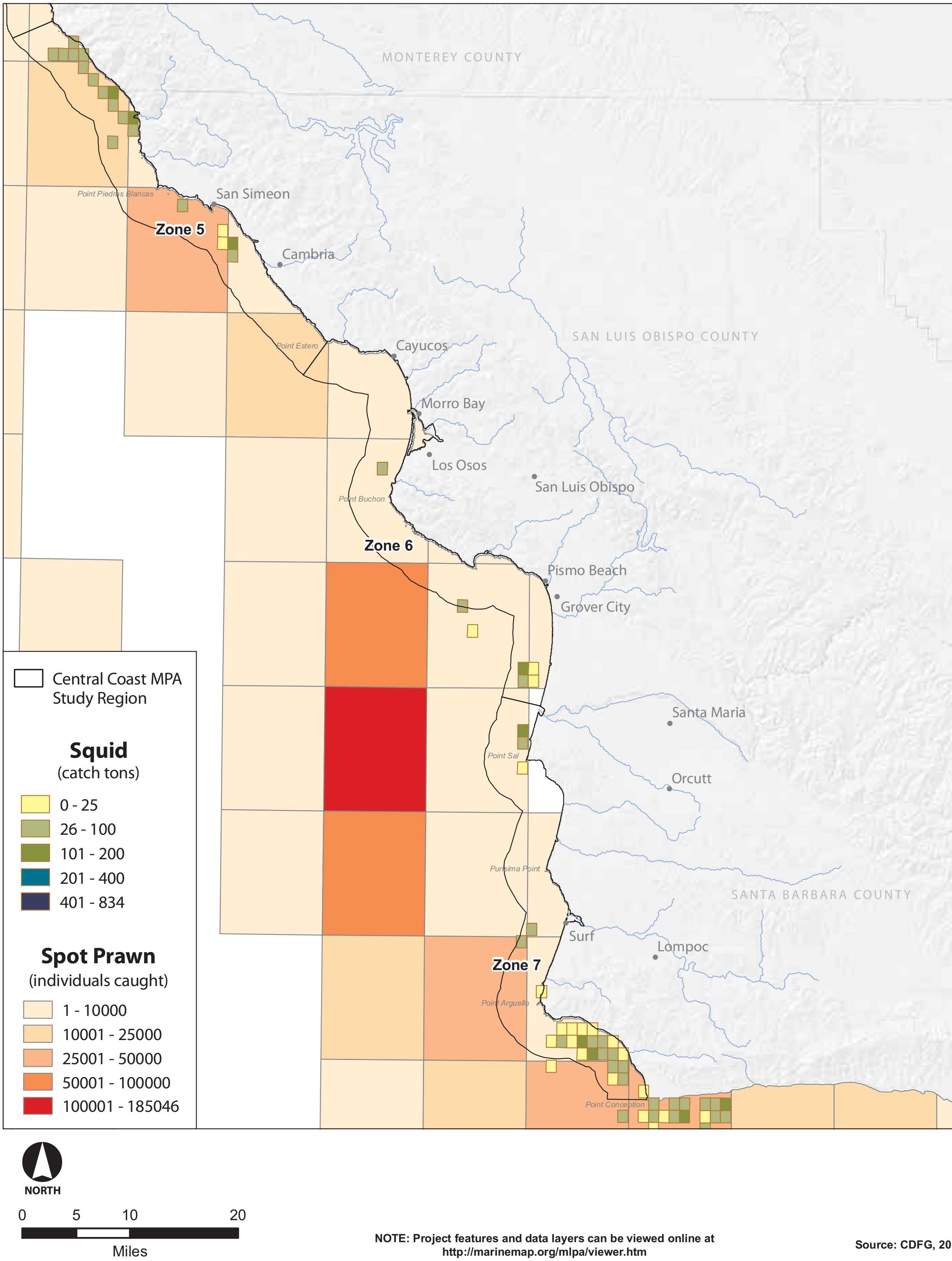
NOTE: Project features and data layers can be viewed online at http://marinemap.org/mlpa/viewer.htm

Source: CDFG, 2006

Figure 4-1a

Commercial Squid and Spot Prawn Catch Northern Study Region

Jones & Stokes



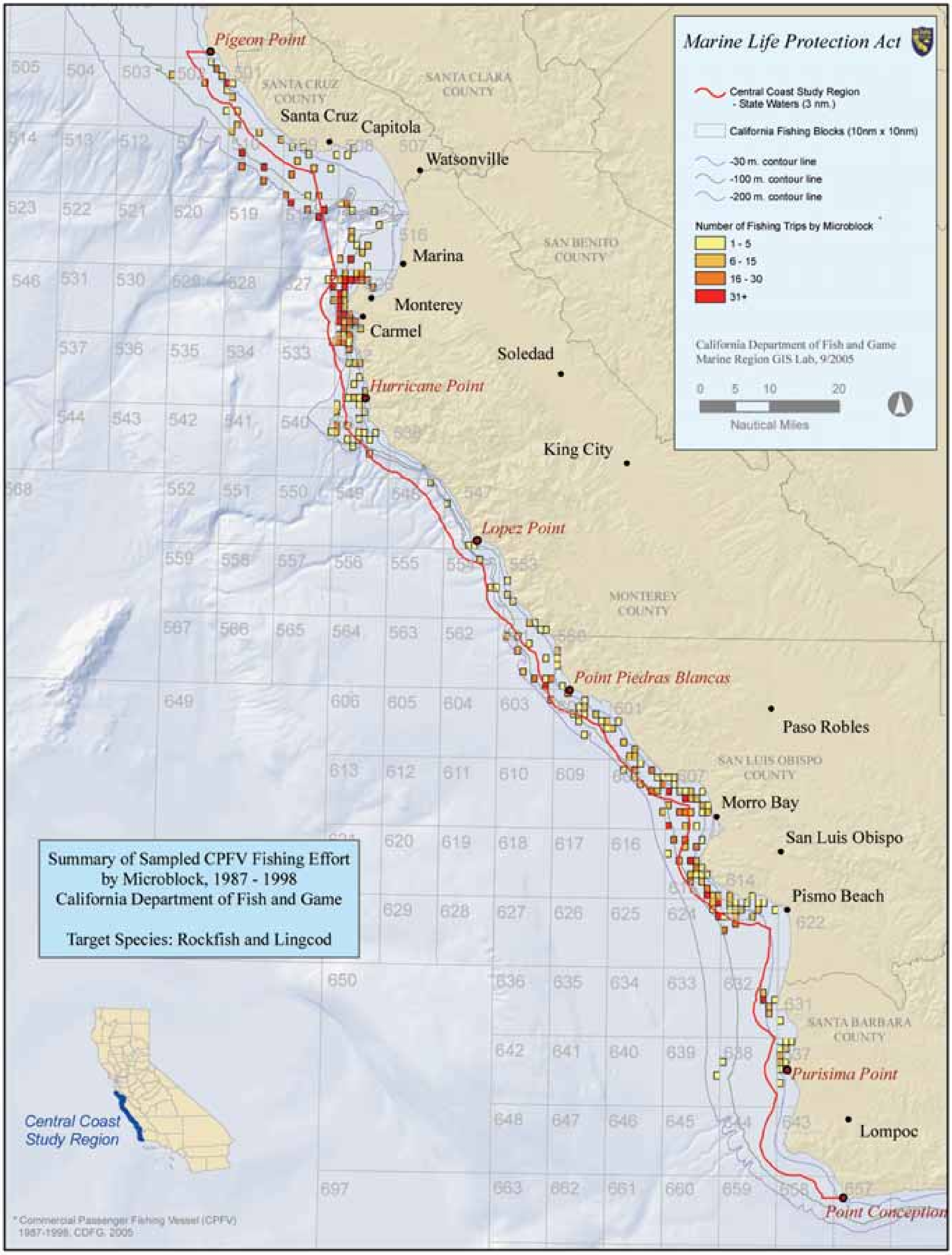
NOTE: Project features and data layers can be viewed online at http://marinemap.org/mlpa/viewer.htm

Source: CDFG, 2006

J:\GIS\PROJECTS\CAL_DFG\06682_06\MAPDOC\FIG4-1_SPOTPRAWN_SQUID.MXD (PG) 08-31-06

Figure 4-1b
Commercial Squid and Spot Prawn Catch
Southern Study Region

Jones & Stokes



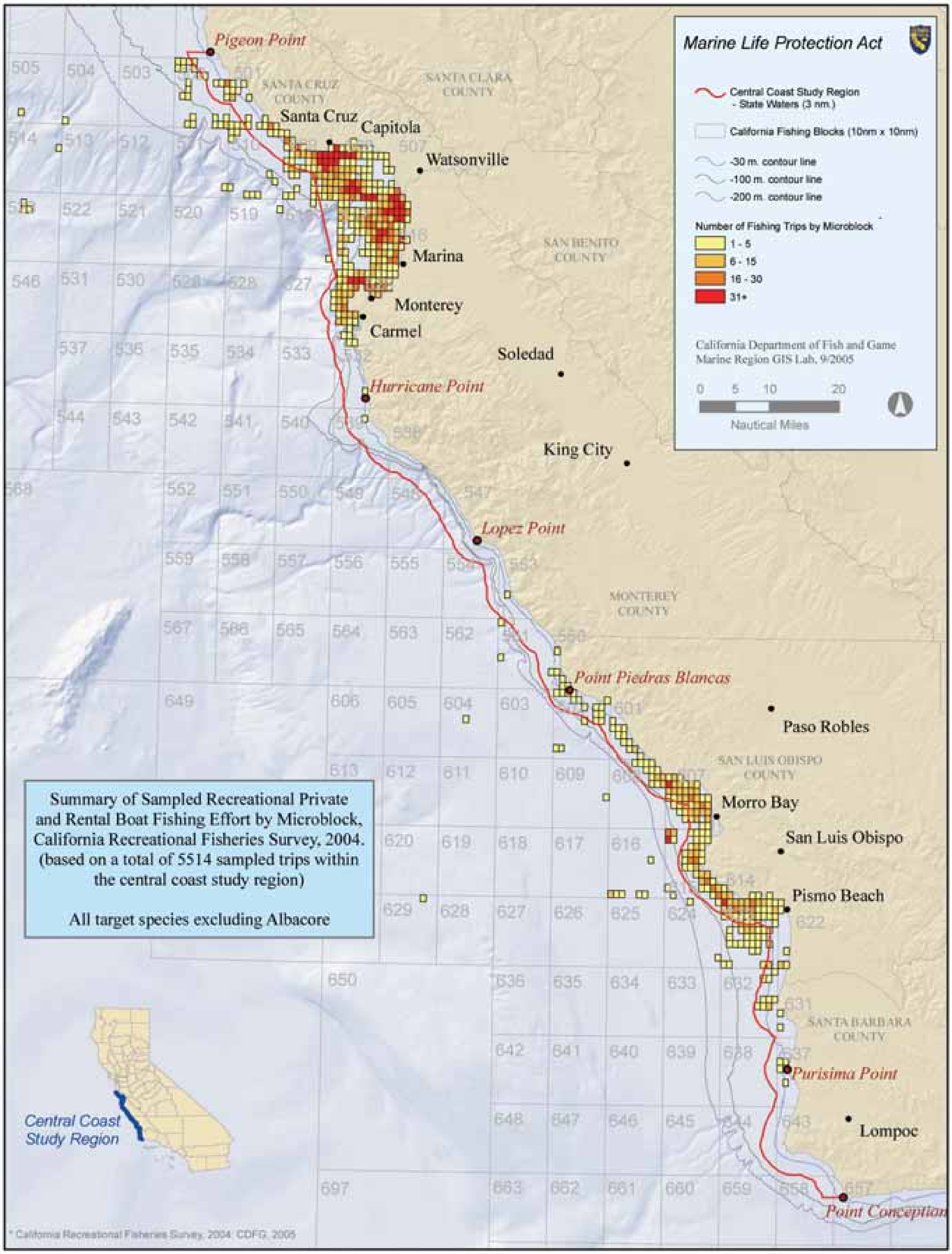
06682.06 EIR (9/06)

Source: CDFG, 2006

Note: Project features and data layers can be viewed in greater detail online at http:/marinemap.org/mlpa/viewer.htm

Jones & Stokes

Figure 4-2
Commercial Passenger Fisheries Survey: Central Coast Rockfish and Lingcod



06682.06 EIR (9/06)

Source: CDFG, 2006

Note: Project features and data layers can be viewed in greater detail online at http:/marinemap.org/mlpa/viewer.htm

Jones & Stokes

Figure 4-3
California Recreational Fisheries Survey:
All Central Coast Target Species (Excluding Albacore)